1079
B.E. (Computer Science and Engineering)
Third Semester
CS-303: Discrete Structures

Time allowed: 3 Hours

Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Section.*

x-x-x

1. (a) Let L be a lattice and a, b, c in L. Write formulas for associative and absorption laws.
   (b) Write disjunctive normal form for $P \wedge (P \rightarrow Q)$
   (c) Give example of a function that is one-to-one, onto and defined everywhere.
   (d) Is there a binary tree of height 6 and 65 leaves? Justify.
   (e) Give truth table for $P \leftrightarrows Q$

   $(2 \times 5 = 10)$

SECTION – A

2. (a) Represent following in symbolic form for:
   Let P="John is healthy", Q="John is wealthy", R="John is wise".
   (i)   John is healthy, wealthy but not wise
   (ii) John is not wealthy but he is healthy and wise
   (iii) John is neither healthy nor wealthy nor wise

   (b) Write short note on Posets and well-ordered sets.

   (6+4=10)

3. (a) If $f(x) = x^2 - 1, g(x) = 3x + 1$, then describe the following functions:
   $gof, \quad fog, \quad gog$ and fof
   (b) Discuss disjunction and conjunction with suitable examples.

   (6+4=10)

4. (a) Discuss equivalence relations and partitions. How Posets are related to equivalence relations?
   (b) Write short note on pigeonhole principle with suitable examples.

   (6+4=10)

SECTION – B

5. (a) Solve: $S_n = -10S_{n-1} + 9S_{n-2}$, where $S_0 = 3, S_1 = 11$
   (b) Discuss shortest path algorithm in weighted graphs.

   (6+4=10)

6. (a) Prove that the number of vertices of odd degree in a graph is always even.
   (b) Is there a graph with five vertices having degrees 1,3,4,2,3 ?
   (c) Discuss generating functions with an example.

   (3+2+5=10)

7. (a) Write short notes on: semigroups, rings and lattices.
   (b) How many regions must a planar graph define if it has 11 edges and 7 nodes?
   (c) Find the maximum number of vertices in k-level binary tree.

   (6+2+2=10)

x-x-x